REMARKS

The Office Action of February 26, 2008, has been received and reviewed. All claims stand rejected. The Application is to be amended as previously set forth. Basis for new clams 22-24 can be found throughout the Specification and more specifically in Example 3. All amendments are made without prejudice or disclaimer. No new matter has been presented. Reconsideration is respectfully requested.

Rejections under 35 U.S.C. § 102(b)

Claim 15 stands rejected under 35 U.S.C. § 102(b) as assertedly being anticipated by Jasinski et al. (Bulletin de la Societe Royale des Sciences de Leige, 68(5-6): 323) in light of Jasinski et al. (The Plant Cell, 13: 1095-1107), and the sequence report appended to the Office Action of February 26, 2008. Applicants respectfully traverse the rejection as hereinafter set forth.

Applicants note that a claim is only anticipated if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631 (Fed. Cir. 1987). Applicants respectfully assert that claim 15 cannot be anticipated by the cited references, because they do not teach each and every element of claim 15. Specifically, claim 15 recites "a sequence having at least 91% identity to a sequence selected from the group consisting of the polynucleotide sequence of SEQ ID NO:1 and the polypeptide sequence of SEQ ID NO:2". As shown by the following BLAST sequence alignments, the Jasinski sequences have only 89% sequence identity to SEQ ID NOs:1 and 2.

Sequence 1: SEQ ID NO:2

Sequence 2: Jasinski accession aj404328

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Score = 2363 bits (6125),  Expect = 0.0
Identities = 1292/1439 (89%), Positives = 1360/1439 (94%), Gaps = 17/1439 (1%)

Query  1    MEPSDLSNFRGRSMRGSMRGS----VRENSNSIWRNNGVEIFSRSTRDEDDEEALKWAAL  56
            MEP+DLSN RGRS+R S+RGS    +RENSNSIWRNNG E+FSRS RDEDDEEALKWAAL
Sbjct  1    MEPADLSNLRGRSLRASIRGSMRGSIRENSNSIWRNNGAEVFSRSARDEDDEEALKWAAL  60

Query  57   EKLPTYDRLRKGILFGSQGTGVAEVDVDDLGVQQRKNLLDRLVKIAEEDNEKFLLKLKNR  116
            EKLPTYDRLRKGILFGSQG   AEVDVDD GV +RKNLL+RLVK+A+EDNEKFLLKLKNR
Sbjct  61   EKLPTYDRLRKGILFGSQGAA-AEVDVDDSGVLERKNLLERLVKVADEDNEKFLLKLKNR  119

Query  117  IDRVGIDFPSIEVRFEHLNIEADAYVGSRALPTFTNFISNFIESLLDSLHILPSKKRSVT  176
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                IDRVGIDFPSIEVRFEHLNI+ADAYVGSRALPTFTNFISNF+E LLDS+HILPSKKR VT
Sbjct  120     IDRVGIDFPSIEVRFEHLNIDADAYVGSRALPTFTNFISNFVEGLLDSIHILPSKKRQVT  179

Query  177     ILKDVSGIVKPCRMTLLLGPPGSGKTTLLLALAGKLDSALRVTGKVTYNGHELHEFVPQR  236
                ILKDVSGIVKPCRMTLLLGPPGSGKTTLLLALAGKLDSAL+VTGKVTYNGHELHEFVPQR
Sbjct  180     ILKDVSGIVKPCRMTLLLGPPGSGKTTLLLALAGKLDSALKVTGKVTYNGHELHEFVPQR  239

Query  237     TAAYISQHDLHIGEMTVRETLEFSARCQGVGSRYEMLAELSRREKAANIKPDADIDMFMK  296
                TAAYISQHDLHIGEMTVRETLEFSARCQGVGSRYEMLAELSRREKAANIKPDADIDMFMK
Sbjct  240     TAAYISQHDLHIGEMTVRETLEFSARCQGVGSRYEMLAELSRREKAANIKPDADIDMFMK  299

Query  297     AASTEGQEAKVITDYVLKILGLDICADTMVGDQMIRGISGGQKKRVTTGEMIVGPSKALF  356
                AASTEGQEAKV+TDY+LKILGLDICADTMVGDQMIRGISGGQKKRVTTGEMIVGPSKALF
Sbjct  300     AASTEGQEAKVVTDYILKILGLDICADTMVGDQMIRGISGGQKKRVTTGEMIVGPSKALF  359

Query  357     MDEISTGLDSSTTYSIVNSLKQSVQILKGTALISLLQPAPETYNLFDDIVLLSDGYIVYQ  416
                MDEISTGLDSSTTYSIVNSLKQSV+I+KGTALISLLQPAPETYNLFDDI+LLSDGYIVY+
Sbjct  360     MDEISTGLDSSTTYSIVNSLKQSVRIMKGTALISLLQPAPETYNLFDDIILLSDGYIVYE  419

Query  417     GPREEVLDFFESMGFKCPNRKGVADFLQEVTSKKDQQQYWVKRDEPYRFITSKEFAEAYQ  476
                GPREEVL+FFESMGFKCP RKG ADFLQEVTSKKDQQQYW++RDEPYRFITSKEFAEAYQ
Sbjct  420     GPREEVLEFFESMGFKCPERKGAADFLQEVTSKKDQQQYWIRRDEPYRFITSKEFAEAYQ  479

Query  477     SFHVGRKVSDELTTAFDKSKSHPAALTTEKYGIGVKQLLKVCTEREFLLMQRNSFVYIFK  536
                SFHVGRKVSDEL T FDKSKSHPAALTT+KYGIG +QLLKVCTERE LLMQRNSFVY+FK
Sbjct  480     SFHVGRKVSDELKTTFDKSKSHPAALTTQKYGIGKRQLLKVCTERELLLMQRNSFVYLFK  539

Query  537     FFQLMVIALMTMTIFFRTKMSRDTETDGGIYSGALFFTVVMLMFNGLSELPLTLYKLPVF  596
                FFQL++IALMTMTIFFRTKM RD+  DGGIYSGALFF V+M+MFNGLSELP+TLYKLPVF
Sbjct  540     FFQLLIIALMTMTIFFRTKMPRDSAEDGGIYSGALFFVVIMIMFNGLSELPMTLYKLPVF  599

Query  597     YKQRDFLFYPSWAYAVPSWILKIPVTFLEVGMWVFLTYYVIGFDPNVGRFFKQFLLLIVV  656
                YKQRDFLFYPSWAYA+PSWILKIPVTF EVGMWVFLTYYV+GFDPNVGRFFKQFLLL++V
Sbjct  600     YKQRDFLFYPSWAYAIPSWILKIPVTFAEVGMWVFLTYYVMGFDPNVGRFFKQFLLLLLV  659

Query  657     NQMASGLFRFIAAVGRTMGVASTFGAFALLLQFALGGFVLARTDVKDWWIWGYWTSPLMF  716
                NQMAS LFRFIAAVGRTMGVASTFGAFALLLQFALGGF+LAR DVKDWWIWGYWTSPLM+
Sbjct  660     NQMASALFRFIAAVGRTMGVASTFGAFALLLQFALGGFILARNDVKDWWIWGYWTSPLMY  719

Query  717     SVNAILVNEFDGKKWKHIAPNGTEPLGPAVVRSQGFFPDAYWYWIGVGALVGFTVLFNIA  776
                SVNAILVNEFDG+KWKHI   GTEPLG AVVR++GFFPDAYWYWIGVGAL GF V+FNIA
Sbjct  720     SVNAILVNEFDGQKWKHIVAGGTEPLGAAVVRARGFFPDAYWYWIGVGALAGFIVMFNIA  779

Query  777     YSLALAYLNPFGKPQATISEESESNENSELSTPIASTTEGDSVGENQNKKGMVLPFEPHS  836
                YS+ALAYLNPF KPQATI  +   N  SE S  I ST EGDS  EN+ KKGMVLPF+PHS
Sbjct  780     YSVALAYLNPFDKPQATI-SDESENNESESSPQITSTQEGDSASENK-KKGMVLPFDPHS  837

Query  837     ITFDEVVYSVDMPPEMREQGTSDNRLVLLKSVSGAFRPGVLTALMGVSGAGKTTLMDVLA  896
                ITFDEVVYSVDMPPEMRE GTSDNRLVLLKSVSGAFRPGVLTALMGVSGAGKTTLMDVLA
Sbjct  838     ITFDEVVYSVDMPPEMRESGTSDNRLVLLKSVSGAFRPGVLTALMGVSGAGKTTLMDVLA  897

Query  897     GRKTGGYIDGSINISGYPKKQETFARISGYCEQNDIHSPYVTVYESLVYSAWLRLPQDVD  956
                GRKTGGYIDGSI ISGYPKKQ+TFARISGYCEQNDIHSPYVTV+ESLVYSAWLRLPQDV+
Sbjct  898     GRKTGGYIDGSIKISGYPKKQDTFARISGYCEQNDIHSPYVTVFESLVYSAWLRLPQDVN  957

Query  957     EKKRMMFVEQVMELVELTPLRSALVGLPGVNG--------LTIAVELVANPSIIFMDEPT  1008
                E+KRMMFVE+VM+LVELTPLRSALVGLPGVNG        LTIAVELVANPSIIFMDEPT
Sbjct  958     EEKRMMFVEEVMDLVELTPLRSALVGLPGVNGLSTEQRKRLTIAVELVANPSIIFMDEPT  1017

Query  1009    SGLDARAAAIVMRAVRNTVDTGRTVVCTIHQPSIDIFEAFDELFLMKRGGQEIYVGPLGR  1068
                SGLDARAAAIVMRAVRNTVDTGRTVVCTIHQPSIDIFEAFDELFLMKRGGQEIYVGPLGR
Sbjct  1018    SGLDARAAAIVMRAVRNTVDTGRTVVCTIHQPSIDIFEAFDELFLMKRGGQEIYVGPLGR  1077

Query  1069    ESSHLIKYFESIPGVTKIKEGYNPATWMLEVTSSSQEITLGVDFTELYKNSDLFRRNKAL  1128
                +S HLIKYFESIPGV+KI EGYNPATWMLEVT+SSQE+ LGVDFT+LYK SDL+RRNKAL
Sbjct  1078    QSCHLIKYFESIPGVSKIVEGYNPATWMLEVTASSQEMALGVDFTDLYKKSDLYRRNKAL  1137

Query  1129    IEELSVPRPGTSDLHFETEFSQPFWVQCMACLWKQHWSYWRNPAYTAVRFLFTTFIALIF  1188
                I+ELSVPRPGTSDLHF++EFSQPFW QCMACLWKQHWSYWRNPAYTAVR +FTTFIALIF
Sbjct  1138    IDELSVPRPGTSDLHFDSEFSQPFWTQCMACLWKQHWSYWRNPAYTAVRLIFTTFIALIF  1197
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Query  1189  GSMFWDIGTKVSGPQDLKNAMGSMYAAVLFLGVQNSSSVQPVVSVERTVFYREKAAGMYS  1248
             G+MFWDIGTKVS  QDL NAMGSMYAAVLFLGVQNSSSVQPVVSVERTVFYREKAAGMYS
Sbjct  1198  GTMFWDIGTKVSRNQDLVNAMGSMYAAVLFLGVQNSSSVQPVVSVERTVFYREKAAGMYS  1257

Query  1249  AMPYAFAQVFIEIPYVFVQAVVYGLIVYSMIGFEWTAAKFFWYFFFMFFTFLYFTFFGMM  1308
             A+PYAFAQV IEIPY+FVQA VYGLIVYSMIGFEWT AKFFW FFFMFFTFLYFTFFGMM
Sbjct  1258  AIPYAFAQVLIEIPYIFVQATVYGLIVYSMIGFEWTVAKFFWDFFFMFFTFLYFTFFGMM  1317

Query  1309  TVAVTPNQNVASIVAGFFYTVWNLFSGFIVPRPRIPIWWRWYYWACPVAWTLYGLVASQF  1368
             TVAVTPNQNVASIVAGFFYTVWNLFSGFIVPRPRIPIWWRWYYW CP+AWTLYGLVASQF
Sbjct  1318  TVAVTPNQNVASIVAGFFYTVWNLFSGFIVPRPRIPIWWRWYYWGCPIAWTLYGLVASQF  1377

Query  1369  GDLQDTIND--QTVEDFLRSSYGFKHDFLGVVAAVIVAFAVVFAFTFALGIKAFNFQRR  1425
             GDLQD + D  QTVE FLRS++GFKHDFLGVVAAVIVAFAVVFAFTFALGIKAFNFQRR
Sbjct  1378  GDLQDPLTDQNQTVEQFLRSNFGFKHDFLGVVAAVIVAFAVVFAFTFALGIKAFNFQRR  1436
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Sequence 1: SEQ ID NO:1

Sequence 2: Jasinski accession aj404328

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Score = 3798 bits (1975),  Expect = 0.0
Identities = 2618/2932 (89%), Gaps = 9/2932 (0%)
Strand=Plus/Plus

Query  168   AAGTATGAGAGGAAGTATGAGAGGAAGTGTAAGGGAAAATAGTAACTCAATATGGAGGAA  227
             |||||| || ||||| |||||||||||| |||| |||||||| || ||||||||||| ||
Sbjct  124   AAGTATAAGGGGAAGCATGAGAGGAAGTATAAGAGAAAATAGCAATTCAATATGGAGAAA  183

Query  228   CAATGGAGTTGAAATATTTTCAAGATCAACTAGAGATGAAGATGATGAAGAGGCATTAAA  287
              ||||| | |||  |||||||  | ||| | || ||||||||||||||||| ||| | ||
Sbjct  184   TAATGGTGCTGAGGTATTTTCGCGTTCAGCGAGGGATGAAGATGATGAAGAAGCACTTAA  243

Query  288   ATGGGCAGCACTTGAGAAATTACCAACATATGATAGATTAAGAAAAGGTATATTGTTTGG  347
             |||||| |||||||| |||||||||| |||||||||||||||||||||||||||||||||
Sbjct  244   ATGGGCTGCACTTGAAAAATTACCAACTTATGATAGATTAAGAAAAGGTATATTGTTTGG  303

Query  348   ATCACAAGGTACTGGTGTTGCTGAAGTTGATGTAGATGATCTTGGTGTTCAACAAAGGAA  407
             |||||||||| ||| ||   ||||||||||||||||||||   ||||||  | |||| ||
Sbjct  304   ATCACAAGGTGCTGCTG---CTGAAGTTGATGTAGATGATTCAGGTGTTTTAGAAAGAAA  360

Query  408   GAATTTGCTTGACAGACTTGTTAAAATTGCTGAAGAAGATAATGAGAAGTTCTTGTTGAA  467
             |||||||||||| |||||||||||| ||||||| ||||||||||||||||| ||| ||||
Sbjct  361   GAATTTGCTTGAAAGACTTGTTAAAGTTGCTGATGAAGATAATGAGAAGTTTTTGCTGAA  420

Query  468   ACTCAAGAACAGGATTGACAGGGTTGGGATTGATTTTCCATCTATAGAAGTGAGATTTGA  527
             ||||||||| || ||||||||||||||||||||||||||||| ||||| |||||||||||
Sbjct  421   ACTCAAGAATAGAATTGACAGGGTTGGGATTGATTTTCCATCAATAGAGGTGAGATTTGA  480

Query  528   GCATCTGAATATTGAGGCAGATGCATATGTTGGTAGCAGAGCTTTGCCTACATTTACCAA  587
             ||||||||||||||| |||||||||||||| || ||||||||||||||||||||||||||
Sbjct  481   GCATCTGAATATTGATGCAGATGCATATGTAGGAAGCAGAGCTTTGCCTACATTTACCAA  540

Query  588   CTTCATTTCTAACTTCATTGAGTCCCTGCTGGATTCACTTCACATCCTTCCATCGAAAAA  647
             |||||||||||||||| |||||  |||  |||||||| ||||||| |||||||| || ||
Sbjct  541   CTTCATTTCTAACTTCGTTGAGGGCCTATTGGATTCAATTCACATACTTCCATCAAAGAA  600

Query  648   ACGTTCAGTTACAATTCTCAAGGATGTTAGTGGTATCGTCAAGCCCTGTCGAATGACTCT  707
             | |   ||||||||||||||||||||||||||| || || ||||||||| ||||||||||
Sbjct  601   AAGGCAAGTTACAATTCTCAAGGATGTTAGTGGCATAGTTAAGCCCTGTAGAATGACTCT  660

Query  708   GCTTTTAGGACCTCCAGGTTCTGGGAAAACAACTTTGTTACTTGCTTTGGCTGGAAAACT  767
              ||||| |||||||| |||||||| ||||| ||||||||||||||||||||||| |||||
Sbjct  661   TCTTTTGGGACCTCCTGGTTCTGGAAAAACTACTTTGTTACTTGCTTTGGCTGGTAAACT  720

Query  768   TGATTCTGCTCTAAGGGTTACGGGGAAGGTGACGTATAATGGACACGAATTACATGAATT  827
             ||| |||||||||| |||||| || |||||||| ||||||||||| ||||||||||| ||
Sbjct  721   TGACTCTGCTCTAAAGGTTACTGGAAAGGTGACATATAATGGACATGAATTACATGAGTT  780
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Query  828   TGTGCCACAAAGAACTGCGGCCTATATTAGCCAGCATGATTTGCATATTGGAGAAATGAC  887
             |||||||||||||||||| || ||||||||||||||||||||||||||||||||||||||
Sbjct  781   TGTGCCACAAAGAACTGCCGCTTATATTAGCCAGCATGATTTGCATATTGGAGAAATGAC  840

Query  888   TGTCAGAGAAACTTTGGAGTTCTCTGCAAGATGCCAAGGAGTTGGTTCTCGTTACGAAAT  947
             ||| ||||||||||||||||||||||||||||||||||| ||||| |||||||| || ||
Sbjct  841   TGTTAGAGAAACTTTGGAGTTCTCTGCAAGATGCCAAGGCGTTGGCTCTCGTTATGAGAT  900

Query  948   GTTGGCCGAACTGTCAAGAAGAGAGAAAGCGGCTAATATCAAACCAGATGCTGATATTGA  1007
             | |||| ||||| ||||||||||||||||| |||||||| ||||||||||||||||||||
Sbjct  901   GCTGGCTGAACTATCAAGAAGAGAGAAAGCAGCTAATATTAAACCAGATGCTGATATTGA  960

Query  1008  CATGTTCATGAAGGCTGCATCAACTGAAGGGCAAGAAGCCAAAGTGATTACTGATTATGT  1067
             |||||||||||||||||||||||| ||||| ||||| ||||||||| |||| |||||  |
Sbjct  961   CATGTTCATGAAGGCTGCATCAACAGAAGGACAAGAGGCCAAAGTGGTTACAGATTACAT  1020

Query  1068  TCTTAAGATTCTGGACTGGATATTTGTGCAGATACTATGGTGGGAGATCAAATGATAAG  1127
             ||||||||| ||||||||||||||||||||||||||||||||||||||||||||||||||
Sbjct  1021  TCTTAAGATACTGGACTGGATATTTGTGCAGATACTATGGTGGGAGATCAAATGATAAG  1080

Query  1128  GGGTATTTCAGGAGGACAGAAGAAGCGTGTCACTACTGGTGAAATGATTGTCGGACCGTC  1187
             |||||||||||||||||||||||||||||| || ||||||||||||||||| ||||| ||
Sbjct  1081  GGGTATTTCAGGAGGACAGAAGAAGCGTGTGACGACTGGTGAAATGATTGTTGGACCCTC  1140

Query  1188  TAAAGCCCTTTTCATGGATGAAATTTCAACTGGACTTGACAGTTCCACAACTTACTCCAT  1247
             |||||| ||||||||||||||||| |||||||||| | |||||||||| |||||||||||
Sbjct  1141  TAAAGCACTTTTCATGGATGAAATATCAACTGGATTGGACAGTTCCACTACTTACTCCAT  1200

Query  1248  CGTGAATTCCCTAAAGCAATCTGTTCAAATCTTGAAAGGAACAGCTCTGATTTCTCTCTT  1307
              ||||||||| ||||||||||||||| |||| |||| |||||||||||||||||||||||
Sbjct  1201  TGTGAATTCCTTAAAGCAATCTGTTCGAATCATGAAGGGAACAGCTCTGATTTCTCTCTT  1260

Query  1308  GCAGCCTGCCCCCGAGACTTACAACTTGTTCGATGATATTGTTCTGCTATCAGATGGCTA  1367
             ||| |||||||||||||| |||||| ||||||| |||||| ||||| |||| ||||| ||
Sbjct  1261  GCAACCTGCCCCCGAGACCTACAACCTGTTCGACGATATTATTCTGTTATCCGATGGGTA  1320

Query  1368  CATTGTTTATCAGGGTCCACGAGAGGAAGTGCTCGATTTCTTTGAATCCATGGATTCAA  1427
              ||||||||| ||||||| ||||||||||||||||| |||||||||||||||||||||||
Sbjct  1321  TATTGTTTATGAGGGTCCGCGAGAGGAAGTGCTCGAGTTCTTTGAATCCATGGATTCAA  1380

Query  1428  ATGCCCCAACAGAAAAGGCGTGGCTGACTTCTTGCAAGAAGTTACATCTAAGAAGGATCA  1487
             ||||||  | ||||||||||  |||||||||||||||||||| |||||||||||||||||
Sbjct  1381  ATGCCCTGAGAGAAAAGGCGCTGCTGACTTCTTGCAAGAAGTGACATCTAAGAAGGATCA  1440

Query  1488  ACAGCAATATTGGGTAAAGAGGGACGAGCCTTATAGGTTTATTACATCAAAAGAATTTGC  1547
             ||||||||||||| | | ||| || ||||||||| |||| || |||||||||||||||||
Sbjct  1441  ACAGCAATATTGGATTAGGAGAGATGAGCCTTATCGGTTCATCACATCAAAAGAATTTGC  1500

Query  1548  TGAGGCTTATCAATCTTTCCATGTTGGGAGAAAAGTAAGCGATGAACTTACAACCGCATT  1607
             ||| |||||||| ||||| |||||||| ||||||||||||||||| || | |||| ||||
Sbjct  1501  TGAAGCTTATCAGTCTTTTCATGTTGGAAGAAAAGTAAGCGATGAGCTCAAAACCACATT  1560

Query  1608  TGACAAGAGCAAAAGCCACCCTGCTGCTTTGACTACTGAAAAGTATGGTATTGGAGTGAA  1667
             ||||||||| ||||||||||||||||||||||||||| ||||||||||||| ||   || 
Sbjct  1561  TGACAAGAGTAAAAGCCACCCTGCTGCTTTGACTACTCAAAAGTATGGTATAGGGAAGAG  1620

Query  1668  ACAACTTTTGAAGGTTTGCACGGAAAGAGAGTTCCTTCTAATGCAGAGGAATTCATTTGT  1727
             ||||||||||||||||||||| ||||||||  |  | |||||||| || || ||||||||
Sbjct  1621  ACAACTTTTGAAGGTTTGCACCGAAAGAGAACTATTGCTAATGCAAAGAAACTCATTTGT  1680

Query  1728  TTACATCTTCAAATTCTTTCAGCTTATGGTAATTGCACTTATGACAATGACCATATTTTT  1787
             |||| ||||||| |||||||||||  || |||| ||||||||||||||||||||||||||
Sbjct  1681  TTACCTCTTCAAGTTCTTTCAGCTCCTGATAATCGCACTTATGACAATGACCATATTTTT  1740

Query  1788  TCGAACTAAGATGTCTCGGGATACTGAGACCGATGGAGGAATTTATTCTGGTGCTCTCTT  1847
              |||||||||||| ||||||||| ||     ||||||||||| |||||||||||||||||
Sbjct  1741  CCGAACTAAGATGCCTCGGGATAGTGCAGAAGATGGAGGAATATATTCTGGTGCTCTCTT  1800

Query  1848  TTTTACGGTTGTTATGCTTATGTTTAATGGTTTGTCTGAGCTTCCTTTGACACTCTACAA  1907
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Sbjct  1801  TTTTGTGGTTATTATGATTATGTTTAATGGTTTGTCCGAGCTCCCTATGACACTTTACAA  1860

Query  1908  GCTCCCGGTCTTCTACAAGCAAAGGGACTTTCTCTTCTATCCTTCATGGGCTTATGCAGT  1967
Sbjct  1861  ACTTCCGGTCTTCTACAAGCAAAGGGACTTTCTCTTCTATCCTTCGTGGGCTTACGCCAT  1920

Query  1968  TCCTTCATGGATCCTAAAAATCCCTGTAACTTTTCTTGAAGTTGGGATGTGGGTGTTTCT  2027
Sbjct  1921  TCCCTCATGGATCCTCAAAATCCCTGTAACTTTGCTGAAGTCGGGATGTGGGTGTTCCT  1980

Query  2028  CACCTATTATGTCATCGGATTTGATCCTAATGTTGGAAGATTTTTCAAACAATTTTTGCT  2087
Sbjct  1981  CACGTATTATGTTATGGGATTTGATCCCAATGTTGGAAGGTTTTTCAAACAATTTTTGCT  2040

Query  2088  ACTCATAGTAGTAAACCAGATGGCATCAGGATTGTTCAGGTTTATTGCAGCAGTTGGAAG  2147
Sbjct  2041  ACTGTTACTAGTAAACCAGATGGCATCAGCATTGTTCAGATTTATCGCGGCAGTAGGAAG  2100

Query  2148  GACCATGGGAGTTGCTAGCACATTTGGAGCATTTGCGCTGCTTTTACAATTTGCATTGGG  2207
Sbjct  2101  GACCATGGGAGTTGCTAGCACATTTGGAGCATTTGCTCTTCTTTTACAATTTGCATTGGG  2160

Query  2208  CGGTTTTGTCCTTGCACGAACTGACGTGAAGGACTGGTGGATTTGGGGATACTGGACCTC  2267
Sbjct  2161  AGGTTTTATTCTTGCGCGAAATGATGTGAAGGATTGGTGGATTTGGGGATACTGGACGTC  2220

Query  2268  ACCACTTATGTTCTCAGTGAATGCAATCCTTGTGAATGAATTTGACGGAAAAAAGTGGAA  2327
Sbjct  2221  ACCGTTGATGTATTCTGTGAATGCAATTCTTGTGAATGAATTTGATGGGCAAAAGTGGAA  2280

Query  2328  ACATATTGCGCCAAATGGAACTGAGCCGCTTGGACCTGCAGTGGTAAGATCTCAAGGGTT  2387
Sbjct  2281  ACATATTGTAGCCGGTGGAACTGAGCCGCTTGGAGCTGCAGTGGTAAGAGCTCGAGGGTT  2340

Query  2388  CTTTCCCGATGCATATTGGTACTGGATAGGTGTAGGTGCACTTGTTGGATTCACAGTTCT  2447
Sbjct  2341  CTTCCCAGATGCATATTGGTACTGGATAGGTGTAGGGGCACTTGCTGGATTCATAGTTAT  2400

Query  2448  GTTTAACATAGCCTACAGTCTTGCTCTCGCTTATCTTAACCCATTCGGAAAGCCACAAGC  2507
Sbjct  2401  GTTTAACATCGCCTACAGTGTTGCTCTCGCTTATCTTAACCCATTTGATAAGCCACAAGC  2460

Query  2508  TACAATTTCAGAAGAAAGTGAGAGCAACGAAAATAGTGAATTATCAACCCCAATAGCTAG  2567
Sbjct  2461  TACGATTTCAGACGAGAGTGAGAATAACGAA---AGTGAATCATCACCCCAGATAACTAG  2517

Query  2568  TACAACGGAAGGAGATTCTGTCGGTGAGAATCAGAATAAGAAAGGAATGGTTCTTCCATT  2627
Sbjct  2518  CACACAAGAAGGAGATTCTGCCAGTGAGAAT---AAGAAGAAGGGAATGGTTCTTCCATT  2574

Query  2628  TGAACCCCATTCCATCACCTTTGATGAAGTTGTATACTCAGTTGACATGCCTCCGGAAAT  2687
Sbjct  2575  TGATCCCCATTCCATCACCTTTGATGAAGTTGTATACTCCGTTGATATGCCTCCGGAAAT  2634

Query  2688  GAGAGAGCAAGGTACCAGTGACAATAGATTGGTACTTTTGAAGAGTGTGAGTGGAGCTTT  2747
Sbjct  2635  GAGAGAGTCAGGTACCAGTGACAATAGATTGGTACTTTTGAAGAGTGTGAGCGGAGCTTT  2694

Query  2748  CAGGCCAGGTGTTCTCACAGCTCTGATGGGAGTTAGTGGAGCCGGTAAAACAACATTGAT  2807
Sbjct  2695  CAGGCCAGGTGTTCTCACAGCTTTGATGGGTGTTAGTGGTGCTGGTAAAACAACATTAAT  2754

Query  2808  GGATGTCTTAGCTGGAAGGAAAACTGGAGGTTACATTGACGGAAGCATTAACATTTCTGG  2867
Sbjct  2755  GGATGTCTTGGCTGGAAGGAAAACCGGAGGTTACATTGACGGGAGCATCAAGATTTCTGG  2814

Query  2868  ATATCCCAAGAAGCAAGAAACATTTGCACGTATTTCTGGATACTGTGAACAAAACGACAT  2927
Sbjct  2815  ATACCCCAAGAAGCAAGATACATTTGCACGTATTTCCGGATACTGTGAACAGAATGACAT  2874
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Query  2928  CCATTCACCTTATGTAACAGTTTATGAGTCCTTGGTTTACTCGGCTTGGCTGCGTTTACC  2987
             ||||||||| ||||||||||||| |||||| ||||||||||| |||||||||||||||||
Sbjct  2875  CCATTCACCGTATGTAACAGTTTTTGAGTCATTGGTTTACTCAGCTTGGCTGCGTTTACC  2934

Query  2988  TCAAGACGTTGATGAGAAAAAGCGAATGATGTTCGTTGAACAAGTTATGGAACTTGTGGA  3047
             |||||||||  ||||  ||||  | |||||||| |||||  |||||||||| ||||||||
Sbjct  2935  TCAAGACGTCAATGAAGAAAAAAGGATGATGTTTGTTGAGGAAGTTATGGATCTTGTGGA  2994

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 Score = 1815 bits (944),  Expect = 0.0
 Identities = 1207/1336 (90%), Gaps = 6/1336 (0%)
 Strand=Plus/Plus

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The Office did not indicate, in the Office Action of February 26, 2008, the method used to find that NpABC1 has "at least 91% sequence identity to SEQ ID NO:2" (Office Action of February 26, 2008, p. 3). Applicants note that BLAST sequence alignment was specifically described in the Specification as a method for calculating sequence identity. (Id., at ¶ [0050]). Consequently, applicants respectfully submit that none of the references teach "an isolated polynucleotide sequence comprising a sequence having at least 91% identity to a sequence selected from the group consisting of the polynucleotide sequence of SEQ ID NO:1 and the polypeptide sequence of SEQ ID NO:2," and respectfully request the rejection of claim 15 under 35 U.S.C. § 102(b) be withdrawn. It is believed claim 15 is in condition for allowance.

Rejections under 35 U.S.C. § 103(a)

Claims 1-13 and 15-19 stand rejected under 35 U.S.C. § 103(a) as assertedly being

unpatentable over Muhitch *et al.* (Plant Science, 157: 201-207; claims 1, 3, 10-13, and 16-19); Rea *et al.* (WO 98/21938; claims 1-13, and 15-19); and Theodoulou (Biochemica et Biophysica Acta, 1465: 79-103) in view of Dudler *et al.* (J. Biol. Chem., 267(9): 5582-5588) in further view of Sidler *et al.* (The Plant Cell, 10:1623-1636; claims 1-13, and 15-19). Applicants respectfully traverse the rejections.

Claims 1, 3, 10-13, and 16-19 stand rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Muhitch *et al.* Muhitch describes the use of an ABC transporter to reduce or eliminate the cytotoxic effects of DAS, a trichothecene product of several fungal genera. The Office Action stated in support of the 35 U.S.C. § 103(a) rejection in view of Muhitch that "claims (1, 3, 10-13, and 16-19) are broadly drawn to processes of enhancing *secretion* of an unspecified secondary metabolite..." (emphasis added). The Office has asserted that it would have been obvious for one of ordinary skill in the art to characterize the *in planta* transport activity of the ABC transporter transgene, to transform tobacco with the transgene, and to select mycoresistant plants and plant cells.

Prior to the currently presented amendments, claims 1, 3, 10-13, and 16-19 recited the element of plant cells and plant cell cultures with enhanced "production or secretion" of secondary metabolites. Applicants respectfully note that the 35 U.S.C. § 103(a) rejection of these claims in light of Muhitch does not establish why it would have been obvious for one of ordinary skill in the art to enhance production of a secondary metabolite through expression of an ABC transporter. Claims 1, 3, 10-13, and 16-19 are amended herein to recite "production" without mention of secretion. For the reasons that follow, Muhitch strongly teaches away from claims 1, 3, 10-13, and 16-19, as amended, to recite production without mention of secretion.

A reference must be considered not only for what it expressly teaches, but also for what it fairly suggests. *In re Baird*, 16 F.3d 380 (Fed. Cir. 1994). The inherent teaching of a prior art reference arises in the obviousness setting as well as under 35 U.S.C. § 102. *In re Grasselli*, 713 F.2d 731 (Fed. Cir. 1983). A reference may be said to teach away when a person of ordinary skill, upon reading it, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path taken by the inventor. *Monarch Knitting Mach. Corp. v. Sulzer Morat Gmbh*, 139 F.3d 877 (Fed. Cir. 1998); *Para-Ordnance Mfg. v. SGS*

Importers Int'l Inc., 73 F.3d 1085 (Fed. Cir. 1995); *In re Gurley*, 27 F.3d 551 (Fed. Cir. 1994).

Muhitch teaches that increased expression of ABC transporters in a cell is correlated with decreased concentrations of substrate toxins in the cytosol of the expressing cell. Therefore, Muhitch teaches away from employing expression of an ABC transporter as a means of increasing the production of a substrate metabolite. In Muhitch, the state of the art with respect to the transport of secondary metabolites is described. For example, in the first paragraph of page 1, it is stated that "[m]ycotoxin-producing fungi have developed strategies to protect themselves from their own toxins... (one) protection strategy is to transport toxins out of the cell via membrane transporter pumps." Furthermore, it is explained in the second paragraph of the Discussion section that "(Muhitch *et al.*) have taken the approach that a reduction in the intracellular levels of toxin should diminish pathogen ingress by removing or decreasing the amounts of fungal virulence factors." In general, Muhitch relies upon, and reinforces, the idea that expression of ABC transporters will lead to a decrease in the intracellular amount of toxic secondary metabolite substrates of those transporters. Muhitch *et al.* expressly attributes the increase in DAS resistance they observed to "toxin export." It is inherently contradictory that expression of an ABC transporter would confer toxin resistance by increasing toxin export, yet also increase production of the toxin. Increased production of a given toxin would serve to act antagonistically to export of the toxin, and would mask the desired phenotype. This characterization of the state of the art with respect to the transport of secondary metabolites is reinforced by Rea *et al.* ("Animal and plant cells have the capacity to eliminate a diversity of lipophilic toxins from the cytosol following conjugation of the toxin with glutathione. This process is mediated by glutathione S-conjugate (GS-X) pumps which are novel MgATP-dependent transporters that catalyze the efflux of GS-conjugates and glutathione disulfide (GSSG) from the cytosol via the plasma membrane and/or endomembranes." WO 98/21938, at page 1, lines 12-20). Rea has been cited by the Office as representative of the state of that art. (See e.g. Rea, Office Action of February 26, 2008, page 9, lines 8-9 and 22-23).

In summary, the state of the art at the time the pending application was filed was that ABC transporters were a poorly understood system thought to have the general cellular purpose of eliminating cytotoxic compounds from the cytosol. The relevant question with respect to the nonobviousness of claims 1, 3, 10-13, and 16-19, as amended, is whether one skilled in the art

who was attempting to solve the problem of increasing, stimulating, or enhancing production of a secondary metabolite would be led by the teachings of Muhitch, or any combination of the cited prior art references, to find the subject matter of the claims obvious. The teaching that ABC transporters function to eliminate their substrates teaches away from expressing a member of the ABC transporter family for the purpose of increasing production of its substrates. Therefore, claims 1, 3, 10-13, and 16-19 were not obvious.

Claims 1-13 and 15-19 stand rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Rea *et al.* Rea describes the transport of secondary metabolites by an ABC transporter into vacuoles. The Office Action of February 26, 2008, states that "[o]ne of ordinary skill would have been motivated by the teachings of Rea that both alkaloid and a pigment could be targeted to a plant vacuole for increased transport using a plant GS-X ABC transporter, [and] would have a reasonable expectation of success in screening for increases in either secretion or production into the vacuole of either anthocyanin or medicarpin...". Applicants respectfully disagree with this analysis.

Rea does not teach enhanced production of a secondary metabolite resulting from expression of an ABC transporter. Applicants do not understand what was meant by "production into the vacuole." As the term is defined in paragraph [0043] of the Specification, "to enhance the production" means that the level of a given metabolite in a transformed plant is enhanced by at least 20% relative to the level in the untransformed plant. This interpretation is consistent with the common usage of the term "production" in the art. Further in paragraph [0043], it is recited that "[a]n enhanced production of a secondary metabolite can result in a detection of a higher level of secondary metabolites in the plant, for example in the vacuole." This statement does not give "production" a contrary meaning to its common usage or its definition in the Specification. For example, a plant exhibiting enhanced production of a secondary metabolite may also exhibit a higher level of that metabolite in the vacuole. It is not true, however, that simply because a transformed plant exhibits a higher level of a secondary metabolite in vacuoles, that the plant exhibits enhanced production of that metabolite.

Rea teaches away from claims 1-13 and 15-19 for the same reasons the Muhitch reference teaches away from claim 1. As discussed supra, it is consistent with the common understanding

of the function of ABC transporters in eliminating toxic substrates that there would be no enhanced production. One way the ABC transport system may have been thought to have functioned at the time the present application was filed is that expression of ABC transporters would result in translocation of substrate molecules from the cytosol to the vacuole without any net increase in substrate that would mitigate the protective role of the ABC transport system.

Claims 1-13 and 15-19 stand rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Theodoulou in view of Dudler *et al.* in further view of Sidler *et al.* (The Plant Cell, 10:1623-1636). The Office Action of February 26, 2008, states that "[t]he claims are broadly drawn to processes of enhancing secretion of an unspecified secondary metabolite". Applicants respectfully disagree with this characterization. Prior to the current amendments to the claims, rejected independent claims 1, 10, 12, 16 and 19 recited "*production* or secretion," and rejected independent claim 7 recited "stimulating the *production*." Furthermore, in the Requirement for Restriction of May 8, 2006, the Office recognized the elected Group 1 as being "drawn to methods of inducing or enhancing production or secretion of a secondary metabolite." *Id.*, at 2. Applicants have reviewed the record, and believe the current amendments and new claims completely respond to the Office's arguments in support of a rejection under 35 U.S.C. § 103(a) in view of Theodoulou, Dudler *et al.*, and Sidler *et al.*

The Theodoulou, Dudler *et al.*, and Sidler *et al.* references do not support the idea that increasing expression of an ABC transporter would result in enhanced production of any secondary metabolite. Furthermore, neither is there any support for the idea in the Muhitch or Rea references. Under a fair reading of these references, they teach only that ABC transporters are involved in the transport of secondary metabolites in plants. The teaching of Theodoulou was described in the Office Action as, "Theodoulou teaches ABC transporter genes from plants that have strong similarity to MDR proteins from other species and suggests a role of the plant homologues in the secretion or sequestering of *vinca* alkaloid and the alkaloid taxol and suggests a strategy for screening transformed plants and plant cells for determining the specific transport function." *Id.*, at 6. While applicants would give a much narrower meaning to the teaching of the Theodoulou reference, due to the equivocal language used by the author to describe the function of ABC transporters in plants, and the difficulties in determining the function of those

transporters he recites (these arguments have already been presented in the Amendments of November 13, 2006; May 16, 2007; and September 28, 2007), even under the Office's broad interpretation, Theodoulou does not suggest that expression of ABC transporters increases or enhances production of secondary metabolites. Neither do the Dudler and Sidler references provide that suggestion.

In fact, Sidler *et al.* specifically refers separately to the transport of the unknown hypocotyl length-increasing compound, which they hypothesize is regulated by an ABC transporter, and the production of that compound. As the authors state in the portion of their discussion entitled, "How May AtPGP1 Affect Hypocotyl Length?":

> An attractive hypothesis is that the AtPGP1 protein is involved in the transport of such a signal. A conceivable function of AtPGP1 would therefore be the export of a hormone-like compound from the shoot apical region that would regulate hypocotyl cell length. The production of this compound would be under the control of the light fluence rate perceived by the cotyledons and possibly other, yet unknown factors, whereas its export would be mediated by the constitutive AtPGP1 exporter. Sidler *et al.*, at 1631.

This passage unarguably shows that Sidler *et al.* does not suggest the ABC transporter described by their work is involved in the production a secondary metabolite.

The Dudler *et al.* reference provides further direction to one of skill in the art that plant ABC transporters are involved in transport, as opposed to production. With respect to members of the ABC transporter family, in general, Dudler *et al.* hypothesize, "it seems likely that they are all involved in some transport process." Dudler, *et al.*, at 5888. Of mammalian P-glycoproteins, they state, "[t]he normal function of these proteins is not known, but it has been hypothesized that it may be the elimination of toxic metabolic or xenobiotic substances." *Id.,* at 5888. Finally, Dudler *et al.* can only conclude from their research that plant ABC transporters are likely to also be involved in transport processes. "[T]he fact that the *Arabidopsis* protein exhibits the highest sequence similarity to the mammalian P-glycoproteins may suggest that functional aspects are also conserved. Thus, the *atpgp1* gene product may be involved in the extrusion of toxic metabolic and xenobiotic compounds from cells." *Id.,* at 5888.

For the foregoing reasons, applicants respectfully assert that there is no express or

inherent suggestion in the art of record that it would have been obvious to one of skill in the art at the time the application was filed to overexpress ABC transporters in plants to increase or enhance the production of a secondary metabolite. Moreover, the state of the art at the time of filing taught away from the use of ABC transporters to increase production of secondary metabolites, as the primary role of those transporters *in planta* was recognized as the elimination of toxic substances from the cytosol of vulnerable cells. For at least these reasons, applicants believe claims 1-13 and 15-19 are nonobvious, and are in condition for allowance. Applicants respectfully request the rejections of these claims be withdrawn.

If questions remain after consideration of the foregoing, the Office is kindly requested to contact applicants' attorney at the address or telephone number given herein.

Respectfully submitted,

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Date: June 11, 2008
DJM/ats

Enclosure: Petition for Extension of Time